START

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 169889

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.		4. Date
Supplemental [ ] Direct Revision [X] Change ECN [ ] Temporary [ ] Standby [ ] Supersedure [ ] Cancel/Void [ ]	L. C. Swanson, Geosciences, H6-06, 6-1438		7/30/93
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	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-EN-AP-130, Rev. 0	9. Related ECN No(s). N/A	10. Related PO No. N/a

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Revision of WHC-SD-EN-AP-130, Rev. 0 to Rev. 1

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13b. Justification Details

Numerous review comments on revision 0 necessitated an upgrade to revision 1, making the document easier to use during the field work.

14. Distribution (include name, MSIN, and no. of copies)

M.P. Connelly H6-06 (1), R.L. Jackson H6-06 (1),
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EPIC H6-08 (2) / Central Files L8-04 (2)

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15. Design Verification Required	16. Cost Impact				17. Schedule Impact (days)	
	ENGINEERING		CONSTRUCTION			
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[X] No	Savings	[] $	Savings	[] $	Delay	[]

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]		[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
N/A		

20. Approvals

Signature		Date	Signature	Date
OPERATIONS AND ENGINEERING			ARCHITECT-ENGINEER	
Cog Engineer L. C. Swanson	LC Swanson	8/2/93	PE	
Cog. Mgr. R. L. Jackson	RL Jackson	8/2/93	QA	
QA			Safety	
Safety			Design	
Security			Environ.	
Environ.			Other	
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Tank Waste Remediation System				
Facilities Operations			DEPARTMENT OF ENERGY	
Restoration & Remediation			Signature or Letter No.	
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SUPPORTING DOCUMENT

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2. Title	3. Number	4. Rev No.
Description of Work for the 200-UP-1 Aquifer Testing Activity	WHC-SD-EN-AP-130	1

5. Key Words

Aquifer testing, pump test, transmissivity, hydraulic conductivity, specific yield, ground water, conceptual model, AAMS, 200-UP-1 Work Plan

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6. Author

Name: L. C. Swanson

L C Swanson 7/30/93
Signature

Organization/Charge Code 81235/PLB53

7. Abstract

This description of work directs field activities for performing several aquifer tests at and near the 200 West Area in support of the 200-UP-1 Project. Tests will consist of slug tests, and single-well and possibly multiple-well constant discharge tests. Test results will be used to expand and refine the hydrogeologic conceptual model of the 200 West Area.

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9. Impact Level 4

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Title of Journal

CHECKLIST FOR SIGNATORIES

Review Required per WHC-CM-3-4	Yes	No	Reviewer - Signature Indicates Approval: Name (printed) / Signature / Date
Classification/Unclassified Controlled Nuclear Information	[ ]	[X]	
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L. C. Swanson LC Swanson 7/30/93

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Responsible Manager (Printed/Signature) Date
R. L. Jackson RL Jackson 7/30/93

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RECORD OF REVISION

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(2) Title

Description of Work for the 200-UP-1 Aquifer Testing Activity

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release		
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Rev. 0	(7) Released per EDT 160868	L. C. Swanson	R. L. Jackson	7/30/93
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CONTENTS

1.0 INTRODUCTION

This description of work (DOW) details the field activities associated with aquifer testing in the uppermost unconfined aquifer beneath portions of the 200 West Area. The focus of aquifer testing is primarily the U-1 and U-2 Crib areas near the uranium, technetium, and nitrate Interim Remedial Measure plumes beneath the U Plant Aggregate Area, although testing will also cover a broader portion of the 200 West Area to supply data needs. This DOW serves as a test plan for those performing the work. It should be used in conjunction with the *Remedial Investigation/ Feasibility Study Work Plan for the 200-UP-1 Groundwater Operable Unit, Hanford Site, Richland, Washington* (DOE-RL 1992a) for general investigation strategy and with *Environmental Investigations and Site Characterization Manual* (WHC 1988c) for specific procedures.

The overall work scope for aquifer testing is defined in Sections 4.2.3 and 5.4.2 of the 200-UP-1 Operable Unit Work Plan. Since existing wells were not found to be suitable for determining vertical communication between aquifers, it was decided to carry out aquifer tests to provide hydraulic conductivities for the uppermost aquifer only (i.e., the Ringold gravel unit E). This effort will fill in hydraulic conductivity data gaps and thereby support refinement of the conceptual model. A more rigorous testing program will be initiated after installation of the planned cluster wells to determine the degree of aquifer intercommunication as described in the work plan.

1.1 SCOPE

This DOW provides technical and administrative guidance for performing slug tests and possibly constant discharge tests in the uppermost aquifer system beneath the 200 West Area. Specific items included in the DOW are test design requirements, field operational requirements, implementation requirements, and data collection guidelines for the aquifer testing. The DOW was prepared in accordance with Environmental Investigation Instruction (EII) 1.14, "Preparation of Descriptions of Work" (WHC 1988c).

The field testing will consist of at least a slug test, a step-drawdown test (as needed), and in some cases a constant discharge test. The slug tests will be used to provide estimates of hydraulic conductivity in areas where little or no data are available, to confirm previous slug test results, and as a check against hydraulic conductivities determined from the constant discharge tests. Step-drawdown testing will be used to determine an optimum discharge rate for the constant discharge test. Constant discharge tests will be performed to estimate the hydraulic conductivity of the aquifer. These tests will usually be single-well tests, but when possible observation wells will be used.

Aquifer tests are planned at seven wells (Table 1 and Figure 1). The reasons for selecting these particular wells and locations are described in Sections 1.2 and 1.3. All the aquifer tests will be conducted in the Ringold Formation gravel unit E. A more extensive aquifer testing program will be implemented later, after the installation of the proposed cluster wells. Field activities are expected to commence in July 1993 and be completed by August 1993. A site visit will be made to each test site prior to testing to determine the suitability of each well for aquifer testing. If a well is not

suitable, the tests may be omitted. Another well may be substituted in this case, subject to all the requirements specified in this document.

1.2 DATA QUALITY OBJECTIVES

The primary data quality objective for the aquifer tests is to provide estimates of hydraulic conductivity to be used in the groundwater numerical model (DOE-RL 1992b). The hydraulic conductivities will enlarge the groundwater model database by filling in data gaps (i.e., areas where hydraulic conductivity values are currently unavailable), or confirming hydraulic conductivity values determined from previous tests. Specific data quality objectives for aquifer testing are listed in Table 4-4 in DOE-RL (1992a); specifically, hydraulic parameter estimates are constrained by the limitations of available testing methodologies to approximate order-of-magnitude values.

The field program generally will consist of single-well constant discharge tests to evaluate aquifer hydraulic conductivities. This test method is expected to yield values of transmissivity that approach the true aquifer transmissivity. At sites where observation wells will be used, it may be possible to estimate other aquifer parameters, such as the vertical hydraulic conductivity and the storage coefficient. These later parameters will also be used in the groundwater model.

1.3 SITE SELECTION CRITERIA

In general, the test wells and locations were based on the data requirements of the groundwater numerical model (i.e., to confirm hydraulic conductivities and to fill in data gaps). Prominent consideration was also given to the area around the U-1 and U-2 cribs where the interim remedial measure is planned. However, the lack of existing wells in the U crib area precluded any testing directly downgradient.

Existing wells were used in all cases because of resource and time limitations. The installation of new characterization wells is costly and requires significant lead time to plan for drilling and aquifer testing. The selection criteria can be summarized as follows.

1. Only existing wells will be tested.

2. The wells must be screened or perforated in the top of the unconfined aquifer so that the data collected at each site will be consistent with other aquifer test results in the model database.

3. The test results should provide confirmatory values of hydraulic conductivity for data in the groundwater model database (which consists of primarily slug test results).

4. The test results should fill in data gaps for the groundwater model.

5. Testing will be performed primarily in the eastern portion of 200 West Area, which is the general direction of contaminant movement from the 200 West Area and the primary area of concern for the groundwater model.

6. Better definition of the lateral extent of an east-west trending high hydraulic conductivity zone just north of the U-1 and U-2 cribs is desired.

7. Multiple wells should be used if possible, which generally provides more representative estimates of hydraulic conductivity, and may also supply additional parameters (vertical hydraulic conductivity and the storage coefficient) that can be incorporated into the groundwater model.

Using these criteria, seven test locations were selected (Table 2). Additional sites (to-be-determined wells) could be selected later if time permits, sufficient resources are still available, and other important data needs for the groundwater model are identified. Appendix A contains information on the construction of these wells.

A well assessment will be performed at each proposed test site prior to testing to determine the suitability of each well for testing. If one or more of the proposed wells is inadequate for testing, alternative locations may be chosen. Alternate wells will be chosen according to the criteria listed above and tested using the same general approach described in this DOW.

Table 1 lists the current proposed wells and general well completion information for each of the aquifer test wells. Figure 1 shows the locations of the wells in the 200 West Area. The nonpumping wells listed in Table 1 are observation wells, which may be close enough to a pumping well to warrant monitoring during the testing activities.

1.4 TESTING LIMITATIONS

Some of the aquifer tests will consist of single-well constant discharge tests. In one case (or maybe two), a multiple-well test will be performed. The multiple-well test(s) may furnish information on the vertical hydraulic conductivity and the storage coefficient of the aquifer. Some general test limitations are identified below.

- The test results will only apply to the top of the unconfined aquifer and should not be considered representative of the entire saturated thickness. This restriction is chosen by design to ensure consistency with past test results. Most historical aquifer testing was performed in the top of the unconfined aquifer, and it is data from these tests that support the groundwater model. This restriction is also a necessity because most of the wells in the 200 West Area are completed in the top of the unconfined aquifer, and aquifer testing will be conducted using existing wells.

- Aquifer testing will not be site-specific to the U-1 and U-2 cribs, which is the source of the several contaminant plumes and the attention of the interim remedial measure. Even though this was a criterion considered for selecting test wells, very few wells are present in this general area. Resource limitations precluded the installation of characterization wells near the cribs.

- The estimated hydraulic conductivity for the single-well tests will be approximations of the true hydraulic conductivity, because several key assumptions of the single-well test analysis are violated under the set test conditions. One significant assumption is the requirement for a fully penetrating well screen (or perforations). Analytical methods are available to handle this variation, but only for multiple-well tests.

Even with these limitations, the aquifer test results are expected to provide reasonable estimates of hydraulic conductivity for the top of the unconfined aquifer. Given (1) the proposed intent of the groundwater modelling effort (an evaluative/scoping tool); (2) the relatively large area covered by the model; and (3) the use of a plan-view two-dimensional model, the hydraulic conductivity data should meet the level of detail required by the groundwater model.

In addition, it is currently perceived that most of the contamination from the U-1 and U-2 cribs is situated at the top of the unconfined aquifer. If this is a correct assumption, then modeling the top of the unconfined aquifer is a reasonable effort for remedial alternatives.

2.0 GENERAL REQUIREMENTS

2.1 REQUIRED DOCUMENTS AND PROCEDURES

All work will be performed in accordance with the following documents and procedures:

- WHC-EP-0383, *Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan* (WHC 1990a)
- WHC-CM-7-7, *Environmental Investigations and Site Characterization Manual* (WHC 1988c)
  - EII 10.1, "Aquifer Testing"
  - EII 10.2, "Measurement of Groundwater Levels"
  - EII 10.3, "Purgewater Management"
  - EII 6.1, "Activity Reports of Field Operations"
  - EII 6.2, "Resource Protection Well Services."

2.2 HEALTH AND SAFETY

All personnel working to this description of work will have completed the 40-hour Hazardous Waste Site Worker training program and will perform all work in accordance with the following:

- WHC-CM-4-10, *Radiation Protection* (WHC 1988e)
- WHC-IP-0692, *Health Physics Procedures Manual* (WHC 1991)
- WHC-CM-4-11, *ALARA Program* (WHC 1988a)

- WHC-CM-4-3, *Industrial Safety Manual* (WHC 1987)
- WHC-CM-7-5, *Environmental Compliance Manual* (WHC 1988b)
- Site-specific health and safety plan or job safety analysis.

3.0 TEST REQUIREMENTS

The following subsections describe specific requirements for the aquifer tests such as determination of pumping rates; the selection of the pump; the equipment setup; the length of each test; and baseline, pre-test, and post-test monitoring.

3.1 TEST TYPES

Ideally, hydraulic conductivity estimates from the slug test data should equal values calculated from the constant discharge test. However, slug test results are readily affected by near-borehole conditions that may not be representative of overall aquifer properties. Influences such as drilling effects, well completion activities, and natural formational heterogeneities can contribute to variations in the hydraulic conductivity. Slug tests are readily influenced by these factors. For this reason, constant discharge tests are planned along with the slug tests to confirm and estimate the hydraulic conductivity of the aquifer.

The ideal testing sequence will consist of an initial slug test (at the pumping well and all observation wells), a step-drawdown test, a constant discharge/recovery test, and a final slug test. The slug test and step-drawdown tests will provide preliminary information for planning and conducting the constant discharge test, including an initial estimate of hydraulic conductivity and an optimum rate of discharge.

At most of the wells, neither the hydraulic conductivity nor the transmissivity has been determined. One exception is well 299-W22-41, where the transmissivity was estimated to be 140 ft^2/d from a previous slug test (WHC 1992). A constant discharge test has not been performed at this well.

At well 299-W22-41, and possibly 699-37-82A, observation wells will be available, making these multiple-well tests. Some historical information is available for aquifer testing in well 699-37-82A, reported in Graham et al. (1981). An evaluation of the Graham test data will be performed to determine if an additional aquifer test is necessary at this site.

The primary objective for the aquifer tests is to determine aquifer hydraulic parameters. For single-well constant-discharge tests, only the hydraulic conductivity (transmissivity) can be determined (an inherent limitation of the method). For multiple-well test(s), additional parameters such as the vertical hydraulic conductivity, the specific yield, and elastic storage coefficient may be estimated.

Slug tests will provide an initial estimate of the aquifer hydraulic conductivity. The slug test conductivities will be compared to conductivities calculated from the constant discharge test to help evaluate the correspondence between these test types.

A pre-test site visit and well assessment is planned to verify the condition and adequacy of the older wells for testing and to check the status of the newer wells. During the well assessment the following tasks should be performed:

- Measure the depth to water
- Tag the bottom of the well
- Note any obstructions in the wells
- Draw a well-head diagram (a Polaroid picture is also recommended)
- Measure the distance to nearby wells (which should be located within 100 ft of the pumping well).

If the initial evaluation of the wells indicates that testing is not feasible (i.e., there is sand fill-up, the desired interval is not accessible, or hydraulic head elevations are not distinct in wells completed as piezometers, etc.) the well will be eliminated as a test site, and no further evaluation is required. Alternate test wells may then be chosen to replace disqualified wells. Potential alternate well sites are indicated on Table 1. If the evaluation does show the well to be viable, the well may be further assessed by running a camera survey.

3.2 SEQUENCE OF FIELD ACTIVITIES

Field activities at each site will begin with the well assessment and, if favorable, end with the final slug test. Figure 4 is a generalized flow chart placing each activity in chronological order. Some of the field activities can be completed as a group: for example, most of the well assessments can be finished before any aquifer testing begins.

Aquifer testing will be initiated only after several administrative tasks are completed. These tasks include the following:

- An environmental assessment to determine the impact of purgewater on endangered, threatened, or sensitive plant and animal species if water is to be disposed of to the ground (only outside the 200 West Area fence)
- A job safety analysis to determine the safety requirements for each site.

3.3 DISCHARGE RATES AND PUMP SELECTION

The primary purpose of the step-drawdown testing will be to estimate the optimal discharge rate for the longer term aquifer test. Two to five steps at

60 to 90 min each may be necessary to make this determination. A reasonable drawdown for the long-term test would be more than 5 ft in the pumping well, not exceeding 50% of the screen or perforated length, and at least 2 to 3 ft in the observation well (if available and nearby).

The final selection of the pump for each well will depend on the results of the step-drawdown tests. An initial best estimate of the discharge rate (and therefore pump selection) will be based on the estimated hydraulic conductivity from the slug test. The pump used for the step-test will be selected from drawdown projections based on the slug test results.

The pump (or riser pipe) should have a backflow (check) valve to prevent water in the pipe draining back into the aquifer after the pump is shut off.

3.4 EQUIPMENT SETUP

The wells will not require any structural modifications for aquifer testing. It may be advantageous to install a packer in the observation well during slug testing in the pumping well to eliminate wellbore storage effects, and thereby increase the measurement sensitivity.

For the step-drawdown tests and constant discharge tests, the pump should be installed within 5 ft of the bottom of the screen, or at a depth that is at least 3 to 10 ft below the level of maximum expected drawdown. This setting should provide an adequate buffer to prevent cavitation.

A calibrated transducer will be used in the pumping and observation wells for baseline monitoring, pre-test water-level monitoring, and during recovery monitoring. The transducer depth setting, the recording frequency, and the calibration requirements are contained in EII 10.1, "Aquifer Testing."

A laboratory or field calibrated flow measurement device (which may be an orifice) will be used to monitor the discharge rate. The measured error of the flow measurement device must not exceed $\pm$10% of the total flow.

If a rotor meter-type flow meter is used for low flow rates (<10 gal/min), the factory calibration is acceptable. The flow rate must be confirmed with a stop watch and container of known volume while running the test.

Field checks must be made to confirm proper operation of any flow measurement device. One useful field check would be using the weighing tank method, where the weight change of water is measured over a specific period of time.

Flow rates should be recorded about every 5 min at the start of the test, and at a maximum of 30- to 60-min intervals after the first 30 min. If a transducer can be used for recording flow rates (as with an orifice), the rate should be set to a logarithmic recording frequency at the start of the test with a maximum rate of every 30 to 60 min.

Flow measurement devices must be installed with the correct length of straight run pipe upstream and downstream from the device per the manufacturers recommendation. Expected flow rates in the 200 West Area are

expected to range from 1 to 50 gal/min based on the estimated hydraulic conductivities (Figure 2).

3.5 TEST LENGTH

In general the constant discharge tests should run until the effects of delayed gravity drainage are minimal and a straight line is defined on a semi-log plot of time versus drawdown. It is anticipated that the test will run from 4 to 8 h, but may require as long as 1 day, depending on aquifer conditions. Final determination on the length of the test is at the discretion of the Aquifer Test Lead. The rationale for stopping the test will be recorded on the field activity report.

At wells where the transmissivities are relatively low and a larger diameter casing is present (8 in. or greater), borehole storage effects will dominant the early time data. Papadopulos and Cooper (1967) give a criterion for estimating the amount of time that wellbore storage impacts the drawdown: $t < 25\ r_c^2 / T$ (modified after Weekes 1977). In this equation, r_c = radius of well casing (L), and T = transmissivity (L/T). This equation can be used to estimate when the wellbore storage is no longer dominant. In the field a unit slope on a log-log graph of the data will indicate borehole storage is dominating the drawdown data.

3.6 BASELINE AND PRE-TEST MONITORING

Before initiating the slug test and starting the constant discharge test, baseline and pre-test water-level trends must be established. A pressure transducer recording frequencies of 1 h should be used to record baseline water-level trends for 3 days or longer. Steel tapes and electric tapes used for measuring water levels must meet the calibration/ standardization requirements in EII 10.2. Barometric monitoring will also be included over the span of the testing, beginning at the time of the baseline monitoring. In addition, if time warrants, a downhole flow meter may be tested to ascertain groundwater flow direction and velocity.

3.7 POST-TEST MONITORING

After pumping is terminated, water-level data collection will continue throughout the recovery period until a dynamic equilibrium is re-established, or the recovery trend is clearly defined. In most cases full recovery is expected to occur in about 2 or 3 days. The final slug test can then be performed at the well.

3.8 CONTROL OF PURGEWATER

Purgewater will be handled in two ways, depending on the quality of the groundwater at the test well and the location of the test. Within the 200 West Area, all generated purgewater must be contained and transported to a predetermined disposal facility (WHC 1990b). Outside of the 200 West Area, if groundwater at the test well is designated as uncontaminated, the water can be

released to the ground surface. It is recommended that the water be disposed at least 100 ft away from the wellhead.

The quality of the groundwater will be documented for each well prior to testing, and thereby the proper method of disposal determined. Constant discharge tests will not be conducted at wells where the purgewater is contaminated and the hydraulic conductivity of the aquifer is relatively high, because of the logistics in containing large volumes of purgewater. Even in wells where the volume of contaminated purgewater would be small, it may not be possible to test if the purgewater cannot be disposed. A sample of the purgewater should be collected at the end of each test for information only, and analyzed at least for nitrate and total activity.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

Data quality is controlled primarily by this DOW and adherence to EII 10.1 on Aquifer Testing. The data at the test wells can be reproduced if the initial test fails by re-running the test. Some of the test sites outside of the 200 West Area may require an evaluation of the impact to endangered, threatened, and sensitive species if it is decided that groundwater can be disposed to the ground.

The quality assurance documents that cover the test activities are the *Quality Assurance Manual* (WHC 1988d) and the *Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan* (WHC 1990a). This aquifer DOW and the aquifer testing is assigned an impact level of 3Q.

5.0 SCHEDULE

Aquifer testing is expected to begin in July 1993 and be completed in August 1993. Testing should be completed as soon as possible to allow enough time for final data reduction and analysis, and to provide input into the final modeling report that is due at the end of the fiscal year. Well assessment activities can begin any time after the applicable administrative tasks listed above are completed. Deviations from this test plan, such as using the alternate wells for testing (Table 1), will require prior regulatory approval.

6.0 REFERENCES

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WHC, 1988a, *ALARA Program*, WHC-CM-4-11, Westinghouse Hanford Company, Richland, Washington.

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WHC, 1988c, *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7, Vol. 1, Westinghouse Hanford Company, Richland, Washington.

WHC, 1988d, *Quality Assurance Manual*, WHC-CM-4-2, Westinghouse Hanford Company, Richland Washington.

WHC, 1988e, *Radiation Protection*, WHC-CM-4-10, Westinghouse Hanford Company, Richland, Washington.

WHC, 1990a, *Environmental Engineering, Technology, and Permitting Function Quality Assurance Program Plan*, WHC-EP-0383, Westinghouse Hanford Company, Richland, Washington.

WHC, 1990b, *Strategy for Handling and Disposing of Purgewater at the Hanford Site, Washington*, WHC-MR-0039, Westinghouse Hanford Company, Richland, Washington.

WHC, 1991, *Health Physics Procedures Manual*, WHC-IP-0692, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992, *Hydrogeologic Model for the 200 West Groundwater Aggregate Area*, WHC-SD-EN-TI-014, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Figure 1. Location Map for the Proposed Aquifer Test Wells in the 200 West Area.

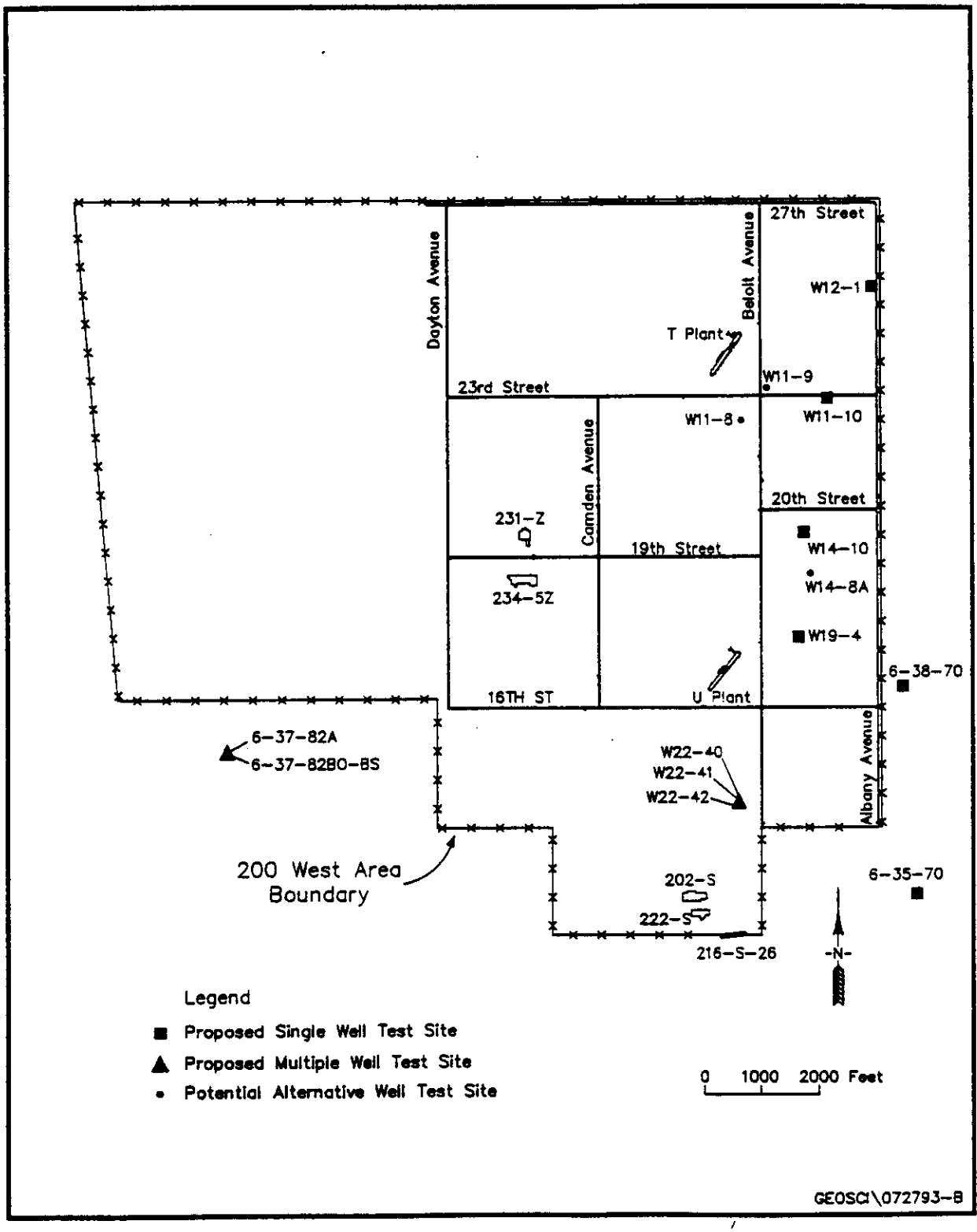


Figure 2. Hydraulic Conductivity Distribution Map of the 200 West Area (after WHC 1992).

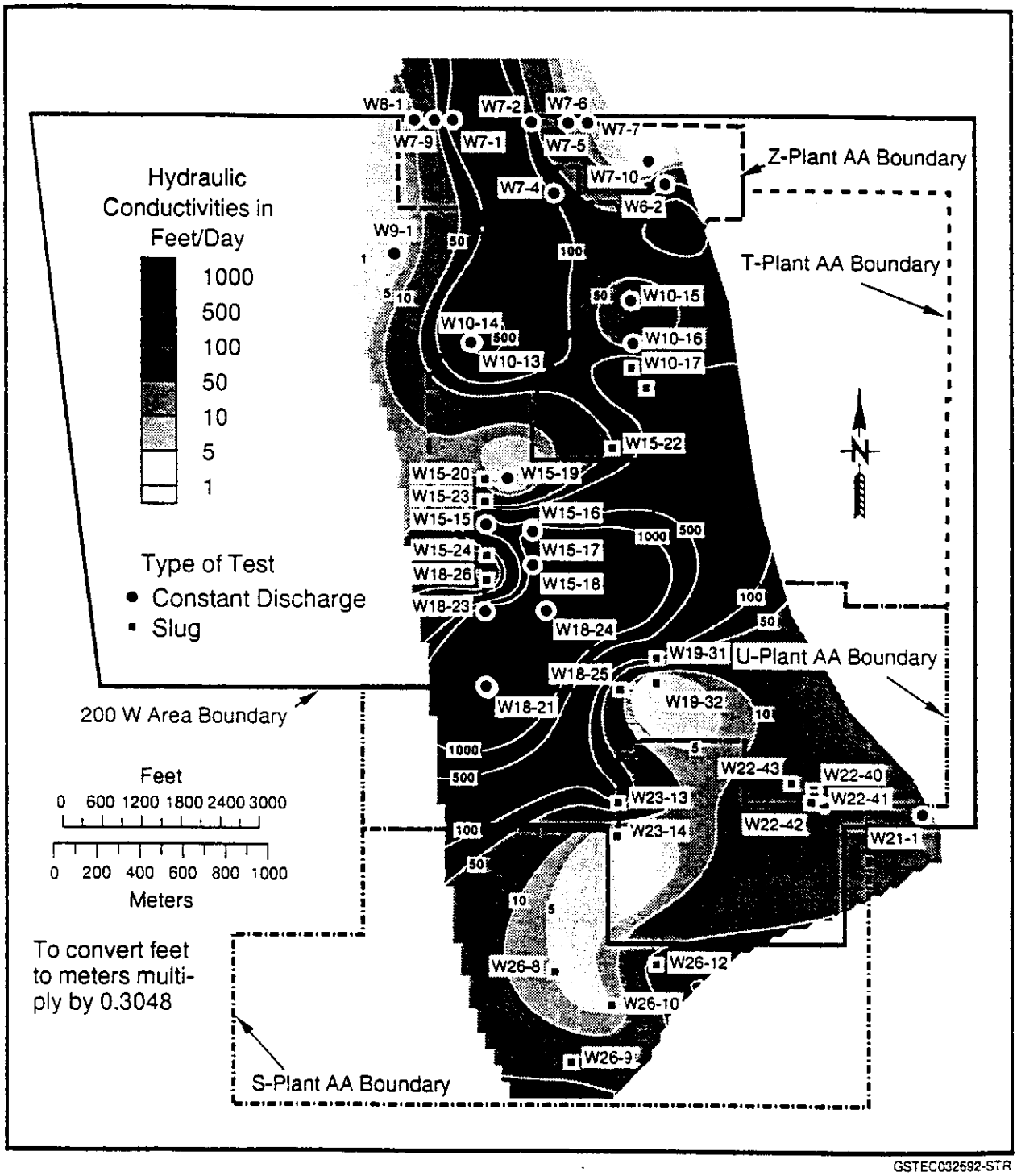


Figure 3. June 1991 Water Table Map of the 200 West Area (after WHC 1992).

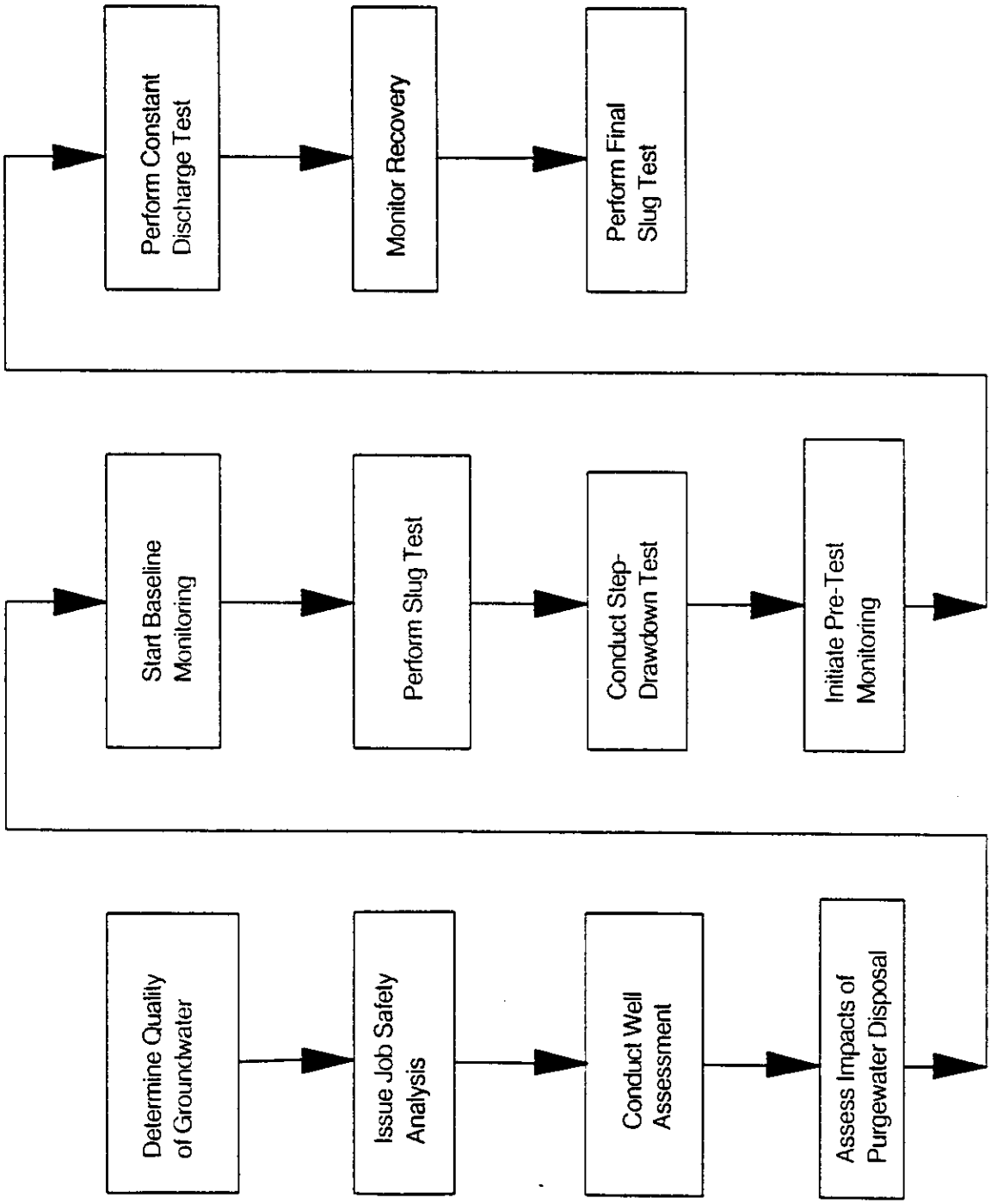


Figure 4. Flow Chart Showing the Sequencing of Aquifer Test Activities.

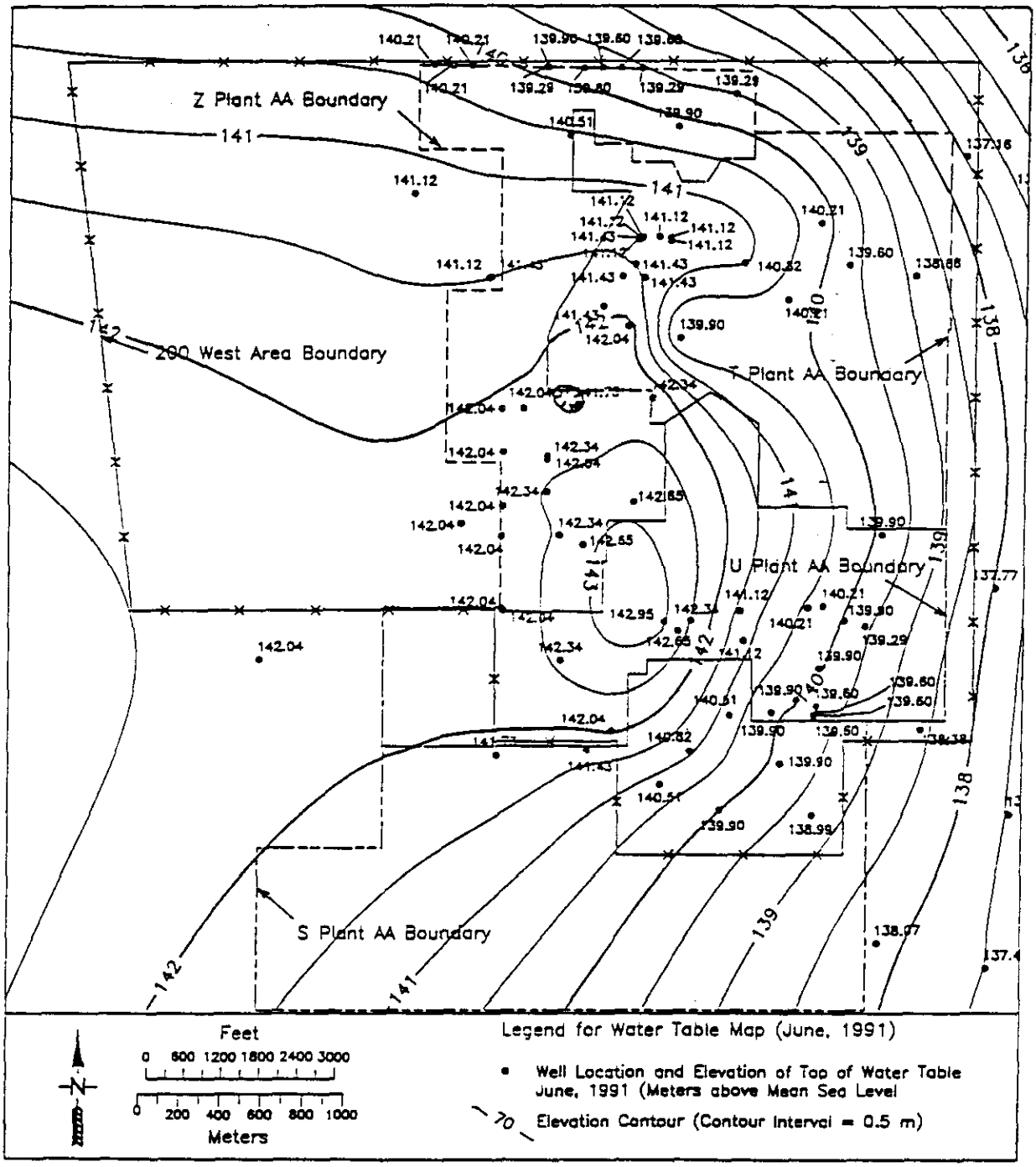


Table 1. Well Construction Summary Information for the Aquifer Test Wells (see Figure 1 for locations).

PERMANENT WELL #	END DRILLING DATE	COMPLETION DEPTH (ft)	TOTAL DEPTH (ft)	DEPTH TO WATER (ft)	SCREEN INTERVAL (ft)	SANDPACK INTERVAL (ft)	ELEVATION BRASS CAP	CASING SIZE (in)
299-W14-10*	JUN 81	~325	330	263, 1991	260-275P	ND	ND	8"-330 10"-242
299-W11-10*	MAR 56	305	307	270, 1991	~256-304P	ND	~726.8	8"-305
299-W12-1*	APR 56	~310	314	273, 1991	~274-309P	ND	~724.2	8"-310
299-W11-8&	NOV 53	313	315	260, 1965	260-310P	ND	ND	8"-313
299-W11-9&	FEB 54	297	297	262, 1991	6" Liner 275-297P	ND	~721	8"-270 6"270-297
299-W19-4&	FEB 60	350	550	255, 1991	255-350	ND	~714	8"-539
299-W14-8A+	FEB 77	ND	563	ND	ND	ND	ND	4"-196 3.5"-473
699-37-82A*	FEB 62	408?	408	ND	~155-175?	ND	636.95	1.5"
699-37-82BO+!	OCT 64	184?	296?	ND	165-185	ND	ND	1.5"
699-37-82BP+!	MAY 64	344?	560?	ND	540-560	ND	636.30	1.5"
699-37-82BQ+!	MAY 64	184	410	ND	390-410	ND	636.30	1.5"
699-37-82BR+!	MAY 64	?	330	ND	310-330	ND	636.30	1.5"
699-37-82BS+!	MAY 64	414?	250?	ND	230-250	ND	636.50	1.5"
299-W22-41*	MAY 90	245	245	231, 1991	224-245 wire wrap 5 slot	220-243 40-100	688.77	10"-132 8"-244
299-W22-40+	MAY 90	244	245	231, 1992	224-244 wire wrap 10 slot	218-242 40	689.22	10"-143 8"-245
299-W22-42+	MAY 90	243	243	230, 1991	223-243 wire wrap 10 slot	219-243 40	688.20	10"-137 8"243
699-35-70*!	SEP 48	253	325	240, ?	235-320P 6" Liner 233-253	ND	693.72	8"-?
699-38-70*!	JUN 57	300	413	270, 1987	255-380P Plug @300	ND	ND	8"

ND=Not Documented
P=Perforations
*=pumping well
+=observation well
&=potential alternate test well
!=graphic construction information not available
?=interpretation of construction information is questionable: if clay cap is not found, this well will not be tested

All other wells on table are for information, due to their location near a test well.

Table 2. Summary Table of Criteria for Selecting Test Wells.

Selection criteria	299-W12-1	299-W11-10	299-W14-10	299-W22-41	699-W38-70	699-W35-70	699-37-82A
Existing Well	X	X	X	X	X	X	X
Screened at Top of Aquifer	X	X	X	X	X	X	X
Near U-1/ U-2 Crib			X	X	X	X	
Confirms Conductivity				X			X
Fills Data Gap	X	X	X		X	X	X
Eastern Side of 200 West	X	X	X		X	X	
Defines High Conductivity Area			X				X
Multiple Wells				X			X

APPENDIX A

WELL CONSTRUCTION AND COMPLETION SUMMARIES

Most of the proposed aquifer test wells were constructed before 1981. Only one well, 299-W22-41, was completed in accordance with the Washington State Department of Ecology construction standards (Chapter 173-160 WAC, 1990). Table 1 lists information o well completions. This appendix contains as-builts and well summaries (as available) fo the proposed test wells.

Many of the wells were constructed of 8-in. carbon steel casing, which was perforated at a specific interval(s) of interest at the time of completion. One well, 299-W22-41, was completed in accordance with Washington State well construction standard Construction materials in this well included 4-in. stainless steel pipe and a continuous wire-wrap 10-slot stainless steel screen. The completion interval for this well was the top 20 ft of the unconfined aquifer.

Most of the wells were drilled using a cable tool drilling rig. Some wells have been modified through time by the addition of liners and plugs. The current status and condition of the wells will not be known until a site visit is made and in some instance a camera survey is conducted. After the well assessment, a decision will then be made o whether the well is suitable for testing. The criteria for this decision are listed in Section 3.2.

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Water
Driller's Name: Close/Gage
Drilling Company: Bach Drilling Co
Date Started: 01Dec59

Sample Method: Drive barrel
Hard tool
Additives Used: Not documented
WA State Lic Nr: Not documented
Company Location: Yakima, WA
Date Complete: 15Feb60

WELL NUMBER: 299-W19-4
TEMPORARY WELL NO: 299-W-39-72
Hanford Coordinates: N/S N 39,000 E/W W 71,999
State Coordinates: N 444,000 E 2,223,000
Start Card #: Not documented T___ R___ S___
Elevation Ground surface (ft): 714.0 Estimated

Depth to water: 270-ft Feb60
(Ground surface) 255.2-ft Dec91

GENERALIZED STRATIGRAPHY / Driller's Log

0-4: SAND
4-15: GRAVEL
15-30: GRAVEL boulders
30-45: SAND & GRAVEL
45-75: GRAVEL & SAND
75-105: SAND
105-115: Hard SAND with hard fine SILT
115-169: SILT & SAND
169-200: Yellow CLAY
200-215: CLAY with small GRAVEL
215-220: CLAY
220-225: Brown CLAY
225-230: CLAY
230-240: CLAY & GRAVEL
240-262: CLAY
262-295: GRAVEL & CLAY
295-300: GRAVEL
300-305: GRAVEL & CLAY
305-315: GRAVEL & SAND
315-335: SAND, GRAVEL & CLAY
335-345: BOULDERS, GRAVEL
345-350: BOULDERS, SAND & CLAY (Cemented gravel)
350-365: BOULDERS, GRAVEL, SAND
365-385: BOULDERS, GRAVEL
385-443: GRAVEL, SAND & CLAY
443-451: CLAY
451-455: SAND & CLAY
455-470: GRAVEL, SAND & CLAY
470-490: GRAVEL, basalt BOULDERS
490-495: BOULDERS, GRAVEL & SAND
495-505: Cement GRAVEL
505-525: CLAY to sandy CLAY
525-535: Sandy GRAVEL
535-539: SAND
539-545: SAND & BASALT
545-550: BASALT

REMEDIATION:
Jun64, by Vincent
Perforated 465-485 and 520-535-ft
Installed three piezometer tubes to 410, 480 and 540-ft and gravel pack.
Tubes were later removed. Details/date were not documented.

- Elevation of reference point (top of casing): [715.26-ft]
- Height of reference point above ground surface: [1.3-ft]
- Depth of surface seal: [ND]
  Type of surface seal: None documented
- I.D. of riser pipe: [8-in]
  Type of riser pipe: Carbon steel
- Diameter of borehole: [9-in nom]
- Depth top of perforations: [255-ft]
  255-443-ft, 2 cuts/rd/ft
  465-485 and 520-535-ft ND
- Probable cement plug at 350-ft
  Installation not documented
- Depth bottom of perforations: [535-ft]
- Depth bottom of casing: [539-ft]
- Depth bottom of borehole: [550-ft]

Drawing By: RKL/2W19-04.ASB Date: 19Jun92

Reference: HANFORD WELLS

9313023194

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 299-W19-4

WELL DESIGNATION	:	2-W19-4
CERCLA UNIT	:	200 Aggregate Area Management Study
RCRA FACILITY	:	Not applicable
HANFORD COORDINATES	:	N 39,000 W 71,999
LAMBERT COORDINATES	:	N 444,000 E 2,223,000
DATE DRILLED	:	Feb60
DEPTH DRILLED (GS)	:	550-ft
MEASURED DEPTH (GS)	:	Not documented
DEPTH TO WATER (GS)	:	270-ft Feb60;
	:	255.2-ft, Dec91
CASING DIAMETER	:	8-in, +1.3-539-ft
ELEV TOP CASING	:	715.26-ft
ELEV GROUND SURFACE	:	714.0-ft, Estimated
PERFORATED INTERVAL	:	255-443 and 465-485-ft
SCREENED INTERVAL	:	Not applicable
COMMENTS	:	FIELD INSPECTION, 09May91, 8-in carbon steel casing. No pad, No. posts, capped and locked. Identification stamped on brass cap. Not in radiation zone. OTHER: Well formerly contained five 1¼-in piezometers, 299W-19-40,P,Q,R and S. All were removed, date not documented. Well apparently now has a cement plug at ~350-ft.
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	Separations area water level measurement, 15Jan64-01Dec91 Not on water sample schedule
PUMP TYPE	:	None documented
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool/rotary core
Drilling Fluid Used: Water/Drill mud
Driller's Name: Baker/Hendrickson
Drilling Company: Hatch/Boyles Bros
Date Cable tool/Core Started: 17Nov76/20Dec76

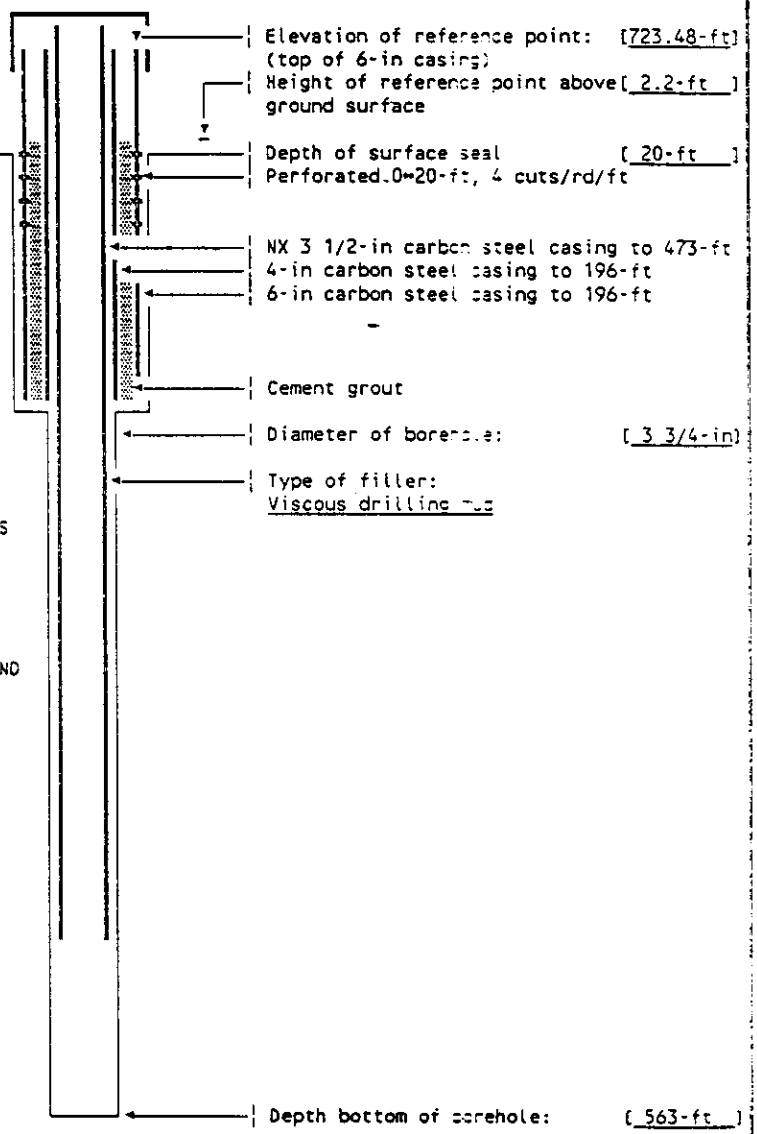
Sample Method: Hard tool/core
Additives Used: Bentonite
WA State Lic Nr: Not documented
Company Location: Pasco/Spokane
Date Cable tool/Core Complete: 02Dec76/09Feb77

WELL NUMBER: 299-W14-8A
TEMPORARY DH-13A
WELL NO: Core hole
Hanford Coordinates: N/S N 40,105 E/W W 71,788
State Coordinates: N 449,222.50 E 2,223,434.22
Start Card #: Not documented T ___ R ___ S ___
Elevation Ground surface (ft): 721.3 Estimated

Depth to water: ND
(Ground surface)

GENERALIZED STRATIGRAPHY — Driller's Log 0-196-ft

0-5: SAND
5-20: Gravelly SAND
20-45: GRAVEL & SAND
45-90: Gravelly SAND
90-168: SAND, SILT lenses 155-157 and 160-168-ft
168-178: SILT
178-196: Ringold ▼ GEOLOGIST'S LOG ▼
196-228: GRAVEL, COBBLES and PEBBLES
228-238: PEBBLES, COBBLES, SAND
238-242: No recovery
242-262: GRAVEL, COBBLES, some SAND
262-280: SAND, some $CaCO_3$ and oxidation
280-339: SAND to gravelly SAND to sandy GRAVEL
339-344: Medium to large GRAVEL, COBBLES
344-351: Fine-medium GRAVEL, COBBLES
351-357: SAND, GRAVEL, COBBLES
357-372: Medium-large GRAVEL
372-382: Large GRAVEL, medium-fine SAND
382-408: Medium-large GRAVEL, COBBLES
408-413: Medium-large GRAVEL, medium SAND
413-418: CLAY stringer
418-436: Medium-large GRAVEL, PEBBLES coarse-medium SAND
436-447: Sandy GRAVEL
447-456: Fine-medium GRAVEL
456-465: Sandy GRAVEL
465-532: Medium-large sandy GRAVEL
532-536: Basalt COBBLES, 20-in SAND stringer
536-546: Vesicular BASALT, some CLAY
546-563: BASALT



Drawing By: RKL/2W14-08A.AS8 Date: 19Jun92

Reference: HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 299-W14-8A

WELL DESIGNATION	:	299-W14-8A
CERCLA UNIT	:	200 Aggregate Area Management Study
RCRA FACILITY	:	Not applicable
HANFORD COORDINATES	:	N 40,105 W 71,788
LAMBERT COORDINATES	:	N 449,222 E 2,223,434
DATE DRILLED	:	Feb77
DEPTH DRILLED (GS)	:	563-ft
MEASURED DEPTH (GS)	:	Not documented
DEPTH TO WATER (GS)	:	Not documented
CASING DIAMETER	:	6-in carbon steel, ~+1.0-196-ft; 4-in carbon steel, ~+1-196-ft; 3½-in carbon steel, ~+1-473-ft
ELEV TOP CASING	:	723.48-ft
ELEV GROUND SURFACE	:	721.3-ft, Estimated
PERFORATED INTERVAL	:	0-20-ft
SCREENED INTERVAL	:	Not applicable
COMMENTS	:	FIELD INSPECTION, 22Apr91, 6, 4 and 3½-in carbon steel casings. No pad, No posts, not capped, not locked. 1½-in PVC pipe stuck in hole. No permanent identification. OTHER: Completed as OH-13A corehole.
AVAILABLE LOGS	:	Driller/Geologist
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	No water level data Not on water sample schedule
PUMP TYPE	:	None documented
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Water
Driller's Name: Bultena/Graham
Drilling Company: Hatch Drilling Co.
Date Started: 27May81 Redrill 23Jun81

Sample Method: Drive barrel / Hard tool
Additives Used: Not documented
WA State Lic Nr: Not documented
Company Location: Pasco, WA
Date Complete: 31Jul81

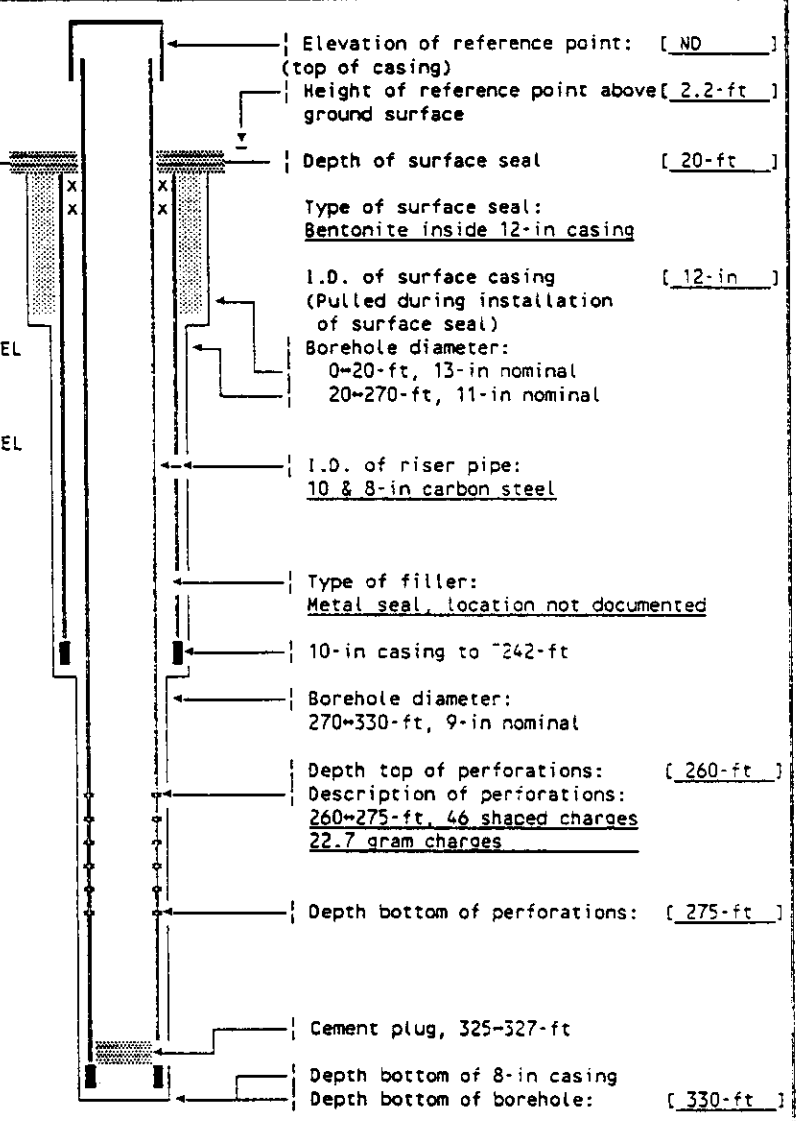
WELL NUMBER: 299-W14-10
TEMPORARY WELL NO:
Hanford Coordinates: N/S N 40,810 E/W W 71,905
State Coordinates: N 445,927 E 2,223,315
Start Card #: Not documented T R S
Elevation Ground surface (ft): Not documented

Depth to water: 265-ft Apr85
(Ground surface) 263.5-ft Apr91

GENERALIZED STRATIGRAPHY — Driller's Log for Redrilled hole

0-45: COBBLES and SAND
45-57: SAND w/small amounts GRAVEL
57-146: Brown & black SAND, lenses of SILT
146-159: Brown SAND and SILT
159-230: Compacted GRAVEL
230-270: Cemented GRAVEL and COBBLES (Ringold) consolidated GRAVEL
270-285: SILT & SAND-SAND & SILT
285-295: Loose heaving SAND
295-324: SAND SILT (heaving SAND)
324-328: SAND-SILT mixed coarse GRAVEL
328-330: 90% fine SAND, 10% small GRAVEL

PERFORATIONS:
28Dec81, by McGhan
Explosive perforation
by shaped charge detonation



Elevation of reference point (top of casing): [ND]
Height of reference point above ground surface: [2.2-ft]
Depth of surface seal: [20-ft]
Type of surface seal: Bentonite inside 12-in casing
I.D. of surface casing (Pulled during installation of surface seal): [12-in]
Borehole diameter:
0-20-ft, 13-in nominal
20-270-ft, 11-in nominal
I.D. of riser pipe: 10 & 8-in carbon steel
Type of filler: Metal seal, location not documented
10-in casing to 242-ft
Borehole diameter: 270-330-ft, 9-in nominal
Depth top of perforations: [260-ft]
Description of perforations: 260-275-ft, 46 shaped charges 22.7 gram charges
Depth bottom of perforations: [275-ft]
Cement plug, 325-327-ft
Depth bottom of 8-in casing
Depth bottom of borehole: [330-ft]

Drawing By: RKL/2W14-10.ASB Date: 19Jun92

Reference: HANFORD WELLS

9 3 1 3 0 2 3 1 9 3 8

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 299-W14-10

WELL DESIGNATION	:	299-W14-10
CERCLA UNIT	:	200 Aggregate Area Management Study
RCRA FACILITY	:	Not applicable
HANFORD COORDINATES	:	N 40,810 W 71,905
LAMBERT COORDINATES	:	N 445,927 E 2,223,315
DATE DRILLED	:	Jul81
DEPTH DRILLED (GS)	:	330-ft
MEASURED DEPTH (GS)	:	315.5-ft, Apr91
DEPTH TO WATER (GS)	:	265-ft, Aug85; 263.5-ft, Apr91
CASING DIAMETER	:	10-in carbon steel, 0-242-ft; 8-in carbon steel, +2.9-330-ft
ELEV TOP CASING	:	Not documented
ELEV GROUND SURFACE	:	Not documented
PERFORATED INTERVAL	:	260-275-ft
SCREENED INTERVAL	:	Not applicable
COMMENTS	:	FIELD INSPECTION, 09May91, 8-in carbon steel casing. 2-ft cement pad, No posts, capped and locked. Well identification stamped on brass cap in pad. Not in radiation zone. OTHER: Perforation done by explosive shaped charges.
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	Water levels measured, 08Mar82-12Apr90 PNL Semi-nual, WHC Quarterly water sample schedule
PUMP TYPE	:	Electric submersible
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Water
Driller's Name: Chausse
Drilling Company: Not documented
Date Started: 20Mar56

Sample Method: Hard tool nom
Additives Used: Not documented
WA State Lic Nr: Not documented
Company Location: Not documented
Date Complete: 16Apr56

WELL NUMBER: 299-W11-10
TEMPORARY WELL NO: 361-T-24
Hanford Coordinates: N/S N 43,150 E/W W 71,500
State Coordinates: N 448,268 E 2,223,714
Start Card #: Not documented T___ R___ S___
Elevation Ground surface (ft): 726.8 Estimated

Depth to water: 279-ft Apr56
(Ground surface) 270.6-ft Dec91

GENERALIZED STRATIGRAPHY — Driller's Log

0-3: TOPSOIL
3-8: GRAVEL
8-16: COBBLES-GRAVEL
16-27: COBBLES, SAND, GRAVEL
27-42: SAND, GRAVEL, COBBLES
42-62: Not documented
62-75: SAND, SILT, GRAVEL
75-141: SAND-SILT
141-165: GRAVEL, SAND and SILT
165-177: SAND and SILT
177-195: GRAVEL(Added bentonite @185-ft)
195-307: SAND, SILT and GRAVEL

Elevation of reference point: [728.89-ft] (top of casing)
Height of reference point above ground surface [2.1-ft]
Depth of surface seal [ND]
Type of surface seal: None documented
I.D. of surface casing [ND]
(None documented)
I.D. of riser pipe: [8-in]
Type of riser pipe: Carbon steel
Diameter of borehole: [9-in nom]
Type of filler: Not documented
Elevation/depth top of seal
Type of seal: Not documented
Depth top of perforations: [256-ft]
Description of perforations: Not documented
Depth bottom of perforations: [304-ft]
Depth bottom of casing: [305.0-ft]
Depth bottom of borehole [307-ft]

Drawing By: RKL/2W11-10.ASB Date: 19Jun92
Reference: HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 299-W11-10

WELL DESIGNATION	:	299-W11-10
CERCLA UNIT	:	200 Aggregate Area Management Study
RCRA FACILITY	:	Not applicable
HANFORD COORDINATES	:	N 43,150 W 71,500
LAMBERT COORDINATES	:	N 448,268 E 2,223,714
DATE DRILLED	:	Apr56
DEPTH DRILLED (GS)	:	307-ft
MEASURED DEPTH (GS)	:	Not documented
DEPTH TO WATER (GS)	:	279-ft, Apr56; 270.6-ft, Dec91
CASING DIAMETER	:	8-in carbon steel, +2.1-305.0-ft;
ELEV TOP CASING	:	728.89-ft
ELEV GROUND SURFACE	:	726.8-ft, Estimated
PERFORATED INTERVAL	:	8-in casing, 256-304-ft
SCREENED INTERVAL	:	Not applicable
COMMENTS	:	FIELD INSPECTION, 21May91, 8-in carbon steel casing. No pad, No posts, capped and locked. No permanent identification. Not in radiation zone. OTHER:
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	Separations area Semiannual water level measurement, 18Apr56-01Dec91 Not on water sample schedule
PUMP TYPE	:	None documented
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Water
Driller's Name: Chausse
Drilling Company: Not documented
Date Started: 17Apr56

Sample Method: Hard tool nom
Additives Used: Not documented
WA State Lic Nr: Not documented
Company Location: Not documented
Date Complete: 09May56

WELL NUMBER: 299-W12-1
TEMPORARY WELL NO: 361-T-25
Hanford Coordinates: N/S N 45,083 E/W W 70,733
State Coordinates: N 450,203 E 2,224,476
Start Card #: Not documented T___ R___ S___
Elevation Ground surface (ft): 724.2 Estimated

Depth to water: 288-ft May56
(Ground surface) 273.1-ft Dec91

GENERALIZED STRATIGRAPHY / Driller's Log

0-10: TOPSOIL-GRAVEL
10-21: SAND-COBBLES
21-72: Not documented
72-110: Pea GRAVEL-SAND-SILT
110-127: Not documented
127-136: GRAVEL, SAND, SILT
144,148: SAND
148-175: Not documented
175-178: SAND-GRAVEL
179,187: BOULDERS, SAND and GRAVEL
187-200: Not documented
200-230: Cemented GRAVEL
230-297: Not documented
297-314 SAND, SILT and GRAVEL

Elevation of reference point: [726.46-ft] (top of casing)
Height of reference point above ground surface [2.26-ft]
Depth of surface seal [ND]
Type of surface seal: None documented
I.D. of surface casing [10-in nom] (Assumed pulled)
I.D. of riser pipe: [8-in]
Type of riser pipe: Carbon steel
Diameter of borehole: [9-in nom]
Type of filler: Not documented
Elevation/depth top of seal
Type of seal: Not documented
Depth top of perforations: [274-ft]
Description of perforations: Not documented
Depth bottom of perforations: [309-ft]
Depth bottom of casing: [310-ft]
Depth bottom of borehole: [314-ft]

Drawing By: RKL/2W12-01.ASB Date: 19Jun92
Reference: HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 299-W12-1

WELL DESIGNATION	:	299-W12-1
CERCLA UNIT	:	200 Aggregate Area Management Study
RCRA FACILITY	:	Not applicable
HANFORD COORDINATES	:	N 45,083 W 70,733
LAMBERT COORDINATES	:	N 450,203 E 2,224,476
DATE DRILLED	:	May56
DEPTH DRILLED (GS)	:	314-ft
MEASURED DEPTH (GS)	:	Not documented
DEPTH TO WATER (GS)	:	288-ft, May56
	:	273.1-ft, 01Dec91
CASING DIAMETER	:	8-in carbon steel, +2.3~310-ft;
ELEV TOP CASING	:	726.46-ft
ELEV GROUND SURFACE	:	724.2-ft Estimated
PERFORATED INTERVAL	:	8-in casing, 274-309-ft
SCREENED INTERVAL	:	Not applicable
COMMENTS	:	FIELD INSPECTION, 22Apr91,
		8-in carbon steel casing.
		No pad, No posts, capped, not locked.
		No permanent icentification.
		Not in radiation zone.
		OTHER:
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	Separations area water level measurement, 21May56~01Dec91
		PNL Annual water sample schedule
PUMP TYPE	:	None documented
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Not documented
Driller's Name: Gentz
Drilling Company: Not documented
Date Started: 02Nov53

Sample Method: Hard tool (nom)
Additives Used: Not documented
WA State Lic Nr: Not documented
Company Location: Not documented
Date Complete: 01Dec53

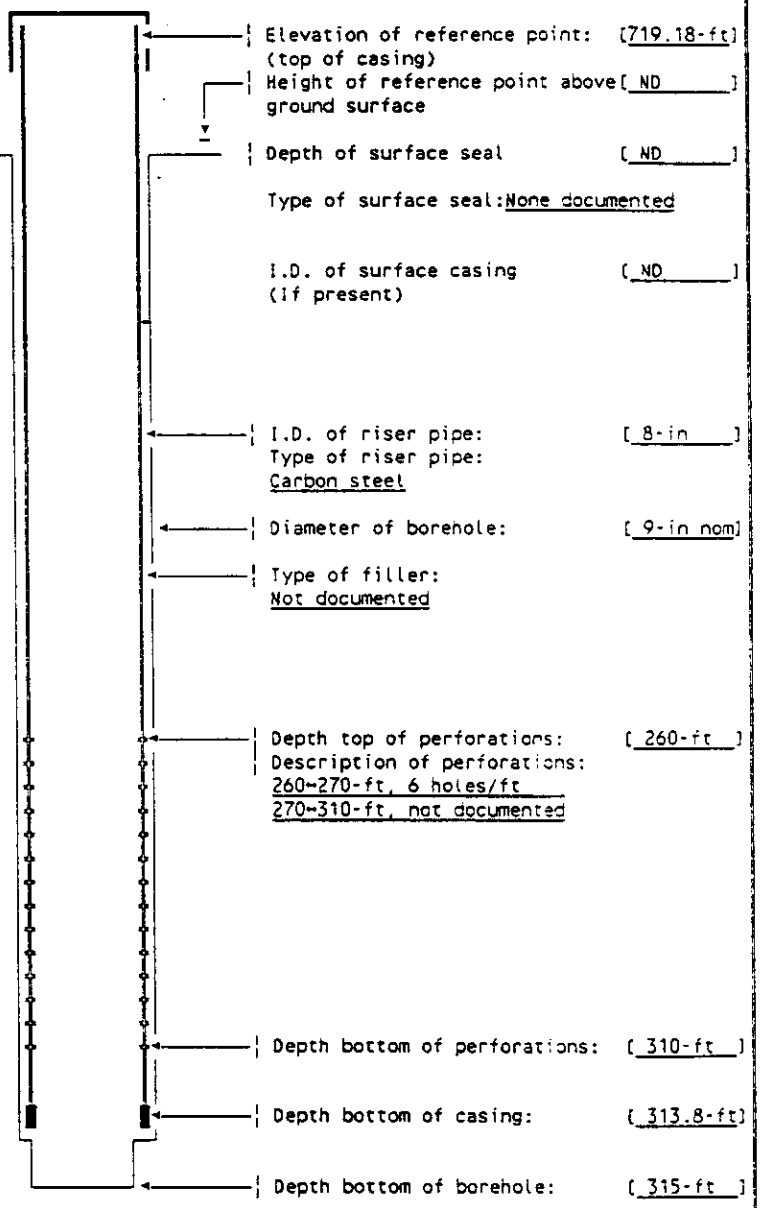
WELL NUMBER: 299-W11-8
TEMPORARY WELL NO: 361-T-22
Hanford Coordinates: N/S N 42,759 E/W W 72,992
State Coordinates: N 447,873 E 2,222,223
Start Card #: Not documented T___ R___ S___
Elevation Ground surface (ft): Not documented

Depth to water: 289-ft Nov53
(Ground surface) 260-ft Jan65

GENERALIZED STRATIGRAPHY — Driller's Log

0-12: Fine SAND
12-22: Coarse GRAVEL
22-34: Coarse GRAVEL and BOULDERS<8-in
34-42: 80% coarse-small GRAVEL, 20% fine gray SAND
42-50: Fine gray SAND, little SILT
50-65: 50%fine gray-50%coarse SAND
65-70: Fine & coarse SAND, little SILT
70-75: SAND and SILT
75-100: Fine brown SAND, little SILT
100-145: SAND and SILT
145-154: SAND, SILT and CALICHE
154-160: 75%coarse gray SAND, 50%small-coarse GRAVEL <2-in
160-173: 25%fine SAND, 75% small&coarse GRAVEL <3-in
173-178: Fine SAND
178-195: 90%coarse GRAVEL, 10%fine SAND
195-210: Coarse GRAVEL up to 5-in
210-215: 25%pea, 75%coarse GRAVEL
215-225: Coarse GRAVEL and COBBLES
225-232: 40%coarse SAND, 40%pea, 20%coarse GRAVEL
232-265: Small GRAVEL, SAND and SILT
265-285: 50%small and coarse GRAVEL 50%fine SAND and SILT
285-300: Coarse GRAVEL, BOULDERS, SAND and SILT
300-310: Small and coarse GRAVEL and fine SAND
310-315: Coarse GRAVEL, BOULDERS and fine SAND

REMEDIATION:
Aug56, by Wall-Richards
Perforated 260-270-ft



Drawing By: RKL/2W11-08.ASB Date: 19Jun92

Reference: HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 299-W11-8

WELL DESIGNATION	:	299-W11-8
CERCLA UNIT	:	200 Aggregate Area Management Study
RCRA FACILITY	:	
HANFORD COORDINATES	:	N 42,759 W 72,992
LAMBERT COORDINATES	:	N 447,873 E 2,222,223
DATE DRILLED	:	Dec53
DEPTH DRILLED (GS)	:	315-ft
MEASURED DEPTH (GS)	:	Not documented
DEPTH TO WATER (GS)	:	289-ft, Sep56; ~260-ft, Jan65
CASING DIAMETER	:	8-in carbon steel, +ND-~314-ft;
ELEV TOP CASING	:	719.18-ft
ELEV GROUND SURFACE	:	Not documented
PERFORATED INTERVAL	:	8-in casing, 260-310-ft
SCREENED INTERVAL	:	Not applicable
COMMENTS	:	FIELD INSPECTION, OTHER:
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	Water levels measured, 21Jan54-19Jan65; Not on water sample schedule
PUMP TYPE	:	None documented
MAINTENANCE	:	

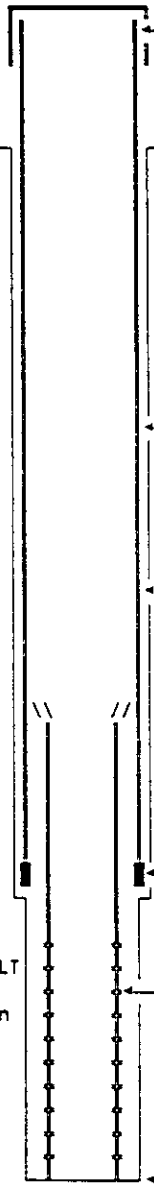
WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool	Sample Method: Hard tool (nom)	WELL NUMBER: 299-W11-9	TEMPORARY WELL NO: 361-T-23
Drilling Fluid Used: Not documented	Additives Used: Bentonite	Hanford Coorcinates: N/S N 43,319	E/W W 72,542
Driller's Name: Gentz	WA State Lic Nr: Not documented	State Coordinates: N 448,435	E 2,222,672
Drilling Company: Not documented	Company Location: Not documented	Start Card #: Not documented	T ___ R ___ S ___
Date Started: 05Feb54	Date Complete: 26Apr54	Elevation Ground surface (ft): 721.0 Estimated	

Depth to water: 285-ft Apr54
(Ground surface) 262.8-ft Dec91

GENERALIZED STRATIGRAPHY — Driller's Log

0-10: COBBLES, coarse GRAVEL and SILT
10-25: BOULDERS, GRAVEL and SAND
25-30: Coarse GRAVEL and SAND
30-35: BOULDERS, GRAVEL, little SAND
35-40: BASALT, COBBLES, little SAND
40-48: COBBLES, GRAVEL, SAND
48-62: Coarse SAND and SILT
62-85: Small and coarse GRAVEL, SAND and SILT
85-90: Coarse and fine SAND
90-100: SAND, little SILT
100-110: Coarse and fine SAND
110-115: SAND, little SILT
115-135: SAND, SILT, CLAY
135-140: SAND, SILT, CALICHE
140-146: SAND, little SILT
146-160: Small and coarse GRAVEL & SAND
160-165: COBBLES, GRAVEL and SAND
165-180: Coarse SAND and GRAVEL
180-185: COBBLES and coarse GRAVEL
185-210: Coarse GRAVEL and SAND
210-220: COBBLES, coarse GRAVEL & SAND
220-235: Coarse GRAVEL, SAND, little SILT
235-245: Coarse GRAVEL, fine SAND
245-250: Coarse GRAVEL, SAND & SILT
250-255: Coarse GRAVEL and SAND
255-262: Coarse GRAVEL, SAND & SILT
262-270: RIND STONE, coarse GRAVEL, SAND, little SILT
270-275: Small and coarse GRAVEL, SAND, little SILT
275-280: GRAVEL, SAND and SILT
280-285: SAND, SILT, little GRAVEL
285-290: Coarse GRAVEL, SAND, little SILT
290-292: SAND, SILT and coarse GRAVEL
292-297: Small and coarse GRAVEL to 4-in
(Drilling with bentonite @ 293-ft)



- Elevation of reference point: [722.94-ft] (top of casing)
- Height of reference point above ground surface [2.0-ft]
- Depth of surface seal [ND]
- Type of surface seal: None documented
- I.D. of surface casing (if present) [ND]
- I.D. of riser pipe: [8-in]
- Type of riser pipe: Carbon steel
- Diameter of borehole: [9-in nom]
- Type of filler: Not documented
- 8-in casing to 270-ft
- 6-in liner 253.5-297-ft
- Top of liner flared to 8-in casing
- Perforated 275-297-ft, 4 holes/ft
- Depth bottom of borehole: [297-ft]

Drawing By: RKL/2W11-09.ASB Date: 19Jun92

Reference: HANFORD WELLS

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 299-W11-9

WELL DESIGNATION	:	299-W11-9
CERCLA UNIT	:	200 Aggregate Area Management Study
RCRA FACILITY	:	
HANFORD COORDINATES	:	N 43,319 W 72,542
LAMBERT COORDINATES	:	N 448,435 E 2,222,672
DATE DRILLED	:	Apr54
DEPTH DRILLED (GS)	:	297-ft
MEASURED DEPTH (GS)	:	Not documented
DEPTH TO WATER (GS)	:	285-ft, Apr54; 262.8-ft, 01Dec91
CASING DIAMETER	:	8-in carbon steel, +2.0-270-ft; 6-in carbon steel liner, 253.5-297-ft
ELEV TOP CASING	:	722.94-ft
ELEV GROUND SURFACE	:	Not documented
PERFORATED INTERVAL	:	6-in liner, 275-297-ft
SCREENED INTERVAL	:	Not applicable
COMMENTS	:	FIELD INSPECTION, 21May91, 8-in carbon steel casing. No pad, No posts, capped and locked. No permanent identification. Not in radiation zone. OTHER:
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	Separations area Semiannual water level measurement, 17Jun54-01Dec91; PNL Annual water sample schedule
PUMP TYPE	:	None documented
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Water
Driller's Name: L. Watkins
Drilling Company: Kaiser Engineers Han
Date Started: 01Mar90

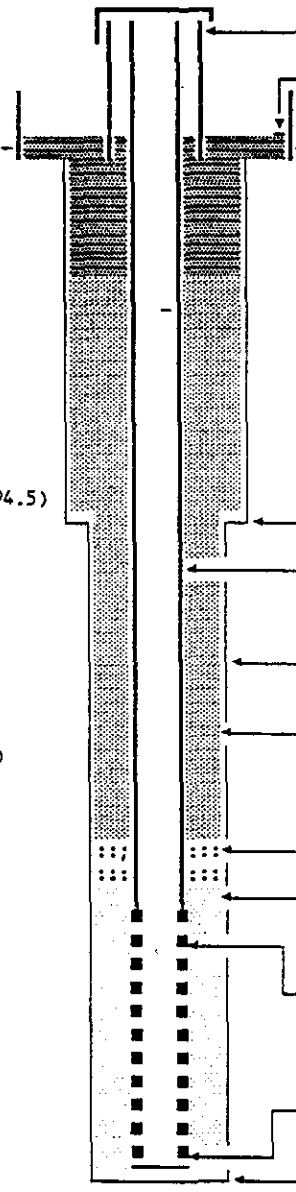
Sample Method: Drive barrel
Additives Used: None
WA State Lic Nr: Not documented
Company Location: Richland, WA
Date Complete: 15May90

WELL NUMBER: 299-W22-40
TEMPORARY WELL NO:
Hanford Coordinates: N/S N 36,242.3 E/W W 73,041.7
State NAD83 Coordinates: N 134,509.99m E 567,634.57m
Start Card #: Not documented T___ R___ S___
Elevation Ground surface (ft): 689.22 Brass cap

Depth to water: 228.1-ft Apr90
(Ground surface) 231.8-ft Mar92

GENERALIZED STRATIGRAPHY / Geologist's Log

5: SAND
10: Slightly gravelly, slightly muddy SAND
15: Slightly muddy SAND
20: Muddy SAND
25,30: Slighlty gravelly SAND
35,40: SAND
43: Muddy SAND
45,50,55: SAND
60: Slightly gravelly SAND
64: Slightly muddy SAND
65: Gravelly SAND
70,75,80,85: SAND
87: Slightly muddy SAND
90,95: SAND (Sl muddy 92-93, 94-94.5)
100: Muddy SAND
105: SAND
110,115: Slightly muddy SAND
120-155: SAND
160,165,170: Slightly muddy SAND
175: Muddy SAND
180: Slightly muddy SAND
185: Muddy SAND
190: Slightly gravelly, slightly muddy SAND
195: Slightly muddy gravelly SAND
200: Slightly muddy SAND
205: Slightly gravelly, slightly muddy SAND
210,215,220: Muddy SAND
225: Slightly muddy SAND
230: Muddy SAND
235,240,245: Muddy sandy GRAVEL



Elevation of reference point: [692.23-ft] (top of casing)
Height of reference point above ground surface [3.0-ft]
Depth of surface seal [20.5-ft]
Type of surface seal: Cement grout
10 3/4-in nominal hole to 143.5-ft.
I.D. of riser pipe: [4-in]
Type of riser pipe: Type 304 stainless steel
Diameter of borehole: [9-in nom] 143.5-245.0-ft
Type of filler, 20.5-211.1-ft: Bentonite crunbles 8-20 mesh
Bentonite pellets, 1/2-3/8-in 211.1-218.1-ft
Depth top of sand pack: [218.1-ft] 40 mesh silica sand to 243.2-ft
Depth top of screen: [224.1-ft] 4-in, #10-slot, Johnson type 304 stainless steel, wire wrapped, with bottom cap and channel pack
Depth bottom of screen: [244.5-ft]
Depth bottom of borehole: [245.0-ft]

Drawing By: RKL/2W22-40.ASB Date: 19Jun92

Reference: WHC-MR-0208, October 1990
KEH Survey Data Report, 18Jun90

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 299-W22-40

WELL DESIGNATION	:	299-W22-40
CERCLA UNIT	:	200 Aggregate Area Management Study
RCRA FACILITY	:	216-U-12
HANFORD COORDINATES	:	N 36,242.3 W 73,041.7
LAMBERT COORDINATES	:	NAD83 N 134,509.99m E 567,634.57m
DATE DRILLED	:	May90
DEPTH DRILLED (GS)	:	245.0-ft
MEASURED DEPTH (GS)	:	244.5-ft
DEPTH TO WATER (GS)	:	228.1-ft, Apr90; 231.8-ft, Mar92
CASING DIAMETER	:	4-in, stainless steel, +ND-224.1-ft; 6-in, stainless steel, +3.0-~0.5-ft (not documented)
ELEV TOP CASING	:	692.33-ft
ELEV GROUND SURFACE	:	689.22 (Brass cap)
PERFORATED INTERVAL	:	Not applicable
SCREENED INTERVAL	:	224.1-244.5-ft, #10-slot, stainless steel
COMMENTS	:	FIELD INSPECTION, OTHER:
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	U-12 crib Quarterly water level measurement, 20Nov90-11Mar92; Not on water sample schedule
PUMP TYPE	:	Hydrostar
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Water
Driller's Name: C. Wamsley
Drilling Company: Kaiser Engineers Han
Date Started: 07Feb90

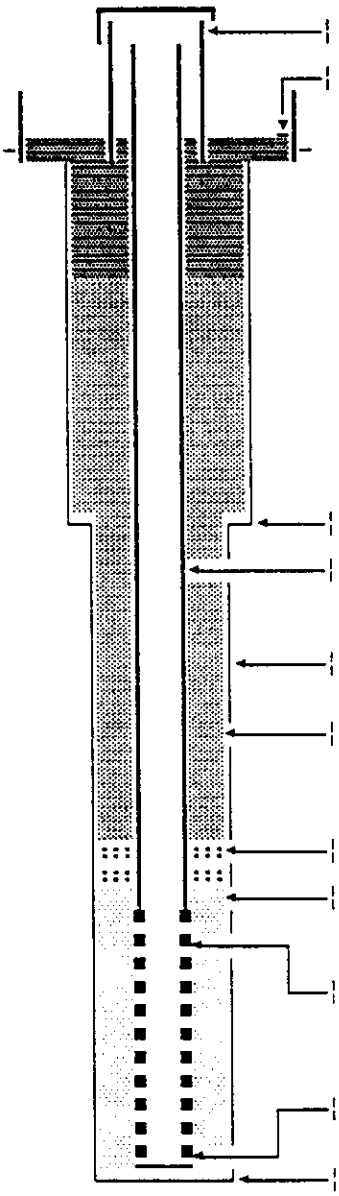
Sample Method: Hard tool
Drive barrel Additives Used: None
WA State Lic Nr: Not documented
Company Location: Richland, WA
Date Complete: 15May90

WELL NUMBER: 299-W22-41
TEMPORARY WELL NO:
Hanford Coordinates: N/S N 36,142.1 E/W W 73,033.8
State NAD83 Coordinates: N 134,479.46m E 567,637.04m
Start Card #: Not documented T___ R___ S___
Elevation Ground surface (ft): 688.77 Brass cap

Depth to water: 228.0-ft Apr90
(Ground surface) 231.2-ft Dec91

GENERALIZED STRATIGRAPHY — Geologist's Log

5: Slightly muddy SAND
10-45: SAND
50: Slightly gravelly SAND
55-105: SAND (slightly cemented at 104 ft)
110: Muddy SAND
115-155: SAND
160: Muddy SAND
165-185: Sandy MUD
190-205: Muddy sandy GRAVEL
210-230: Sandy MUD
235-245: Muddy sandy GRAVEL



Elevation of reference point: [691.74-ft] (top of casing)
Height of reference point above ground surface [3.0 ft]
Depth of surface seal [18.4-ft]
Type of surface seal: Cement grout
10 3/4-in nominal hole to 132.1-ft
I.D. of riser pipe: [4-in]
Type of riser pipe: Type 304 stainless steel
Diameter of borehole: [9-in nom]
132.1-244.4-ft
Type of filler, 18.4-215.4-ft: Bentonite crumbles 8-20 mesh
Bentonite pellets, 1/2-3/8-in 215.4-220.7-ft
Depth top of sand pack: [220.7-ft] 40-100 mesh silica sand to 243.7-ft
Depth top of screen: [224.1-ft] 4-in, #5-slot, Johnson type 304 stainless steel, wire wrapped, with bottom cap.
Depth bottom of screen: [245.3-ft]
Depth bottom of borehole: [245.3-ft]

Drawing By: RKL/2W22-41.ASB Date: 19Jun92

Reference: WHC-MR-0208, October 1990
KEH Survey Data Report, 18Jun90

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 299-W22-41

WELL DESIGNATION	:	299-W22-41
CERCLA UNIT	:	200 Aggregate Area Management Study
RCRA FACILITY	:	216-U-12
HANFORD COORDINATES	:	N 36,142.1 W 73,033.8
LAMBERT COORDINATES	:	NAD83 N 134,479.46m E 567,637.04m
DATE DRILLED	:	May90
DEPTH DRILLED (GS)	:	245.3-ft
MEASURED DEPTH (GS)	:	245.3-ft
DEPTH TO WATER (GS)	:	228.0-ft, Apr90; 231.3-ft, Mar91
CASING DIAMETER	:	4-in, stainless steel, +ND-224.1-ft; 6-in, stainless steel, +3.0-~0.5-ft (not documented)
ELEV TOP CASING	:	691.74-ft
ELEV GROUND SURFACE	:	688.77 (Brass cap)
PERFORATED INTERVAL	:	Not applicable
SCREENED INTERVAL	:	224.1-245.3-ft, #5-slot, stainless steel
COMMENTS	:	FIELD INSPECTION; OTHER:
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	U-12 Crib Quarterly water level measurement, 20Nov90-11Mar91; Not on water sample schedule
PUMP TYPE	:	Hydrostar
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Water
Driller's Name: G. Lydin
Drilling Company: Kaiser Engineers Han
Date Started: 12Feb90

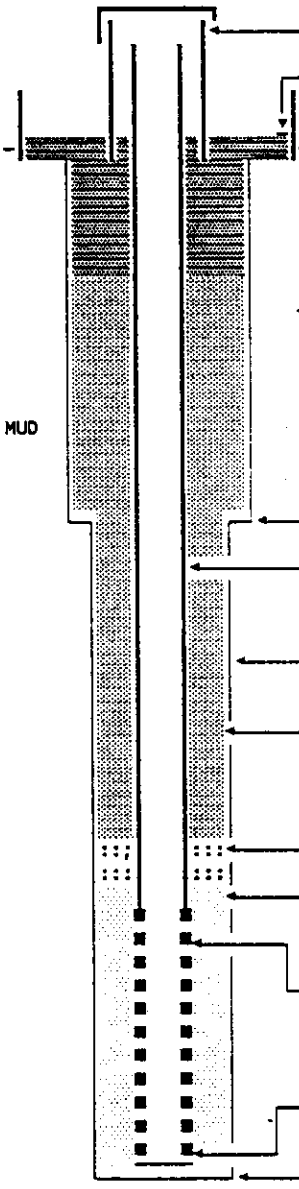
Sample Method: Drive barrel Hard tool
Additives Used: None
WA State Lic Nr: Not documented
Company Location: Richland, WA
Date Complete: 15May90

WELL NUMBER: 299-W22-42
TEMPORARY WELL NO:
Hanford Coordinates: N/S N 36,052.7 E/W W 73,079.6
State NAD83 Coordinates: N 134,452.20m E 567,623.16m
Start Card #: Not documented T___ R___ S___
Elevation Ground surface (ft): 688.20 Brass cap

Depth to water: 227.0-ft Apr90
(Ground surface) 230.6-ft Dec91

GENERALIZED STRATIGRAPHY / Geologist's Log

5-30: SAND
35: Slightly muddy SAND
40,45: SAND
50: Gravelly SAND
55-150: SAND
155: Slightly muddy SAND
160: Muddy SAND
165,170: Sandy MUD
175-185: Muddy SAND
190,195: Gravelly muddy SAND
200,205: Muddy SAND
210,215: Slightly gravelly sandy MUD
220,225: Sandy MUD
230: Muddy SAND
235-245: Muddy sandy GRAVEL



Elevation of reference point (top of casing): [691.16-ft]
Height of reference point above ground surface: [3.0-ft]
Depth of surface seal: [18.8-ft]
Type of surface seal: Cement grout
10 3/4-in nominal hole to 137.7-ft.
I.D. of riser pipe: [4-in]
Type of riser pipe: Type 304 stainless steel
Diameter of borehole: [9-in nom]
137.7-243.4-ft
Type of filler, 18.8-215.2-ft: Bentonite crumbles 8-20 mesh
Bentonite pellets, 1/2-3/8-in 215.2-219.7-ft
Depth top of sand pack: [219.7-ft]
40-mesh silica sand to 243.2-ft
Depth top of screen: [223.1-ft]
4-in, #10-slot, Johnson type 304 stainless steel, wire wrapped, with bottom cap.
Depth bottom of screen: [243.4-ft]
Depth bottom of borehole: [243.4-ft]

Drawing By: RKL/2W22-42.ASB Date: 19Jun92

Reference: WHC-MR-0208, October 1990
KEH Survey Data Report 18Jun90

SUMMARY OF CONSTRUCTION DATA AND FIELD OBSERVATIONS
RESOURCE PROTECTION WELL - 299-W22-42

WELL DESIGNATION	:	299-W22-42
CERCLA UNIT	:	200 Aggregate Area Management Study
RCRA FACILITY	:	216-U-12
HANFORD COORDINATES	:	N 36,052.7 W 73,079.6
LAMBERT COORDINATES	:	NAD83 N 134,452.20m E 567,623.16m
DATE DRILLED	:	May90
DEPTH DRILLED (GS)	:	243.4-ft
MEASURED DEPTH (GS)	:	243.4-ft
DEPTH TO WATER (GS)	:	227.0-ft, Apr90; 230.6-ft, Dec91
CASING DIAMETER	:	4-in, stainless steel, ~+1.0~223.1-ft; 6-in stainless steel, +3.0~~0.5-ft (not documented)
ELEV TOP CASING	:	691.16-ft
ELEV GROUND SURFACE	:	688.20 (Brass cap)
PERFORATED INTERVAL	:	Not applicable
SCREENED INTERVAL	:	223.1~243.4-ft, 10-slot, stainless steel
COMMENTS	:	FIELD INSPECTION: OTHER:
AVAILABLE LOGS	:	Driller
TV SCAN COMMENTS	:	Not applicable
DATE EVALUATED	:	Not applicable
EVAL RECOMMENDATION	:	Not applicable
LISTED USE	:	Water levels measured, 20Nov90~10Dec91; Not on water sample schedule
PUMP TYPE	:	Hydrostar
MAINTENANCE	:	

WELL CONSTRUCTION AND COMPLETION SUMMARY

Drilling Method: Cable tool
Drilling Fluid Used: Water
Driller's Name: Swain
Drilling Company: Not documented
Date Started: 17May57

Sample Method: Hard tool (nom)
Additives Used: Bentonite
WA State Lic Nr: Not documented
Company Location: ND
Date Complete: 14Jun57

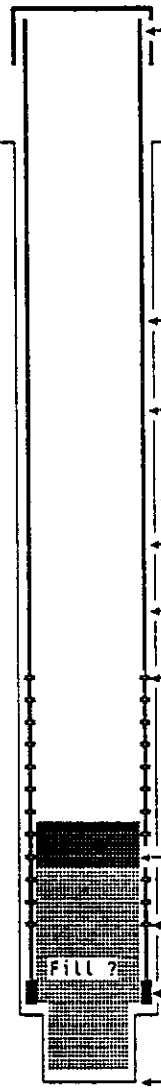
WELL NUMBER: 699-38-70
TEMPORARY WELL NO:
Hanford Coordinates: N/S N 38,142 E/W W 70,226
State Coordinates: N 443,264 E 2,225,001
Start Card #: Not documented T___ R___ S___
Elevation Ground surface (ft): Not documented

Depth to water: 270-ft Jun87

GENERALIZED STRATIGRAPHY / Driller's Log

0-5: SAND
5-15: Small GRAVEL
15-25: Sandy SILT-GRAVEL
25-30: SILT, coarse SAND
30-45: Sandy SILT
45-55: SAND-SILT-GRAVEL
55-70: SAND-SILT
70-72: SAND-small GRAVEL
72-80: SAND-coarse and clean
80-120: SAND-SILT
120-130: SAND-SILT (harder packed)
130-190: SAND-SILT
190-200: SAND-SILT-small GRAVEL (water)
200-205: SAND-SILT-small GRAVEL
205-220: SAND-SILT
220-230 SAND-SILT, soft, more CLAY than SAND
230-245: Small GRAVEL-CLAY
245-250: CLAY
250-260: CLAY-GRAVEL
260-265: SAND-SILT-GRAVEL
265-310: SAND-GRAVEL, mostly clean
310-315: SAND-GRAVEL, a little SILT
315-320: SAND-SILT-GRAVEL-CLAY
320-335: SAND, SILT and GRAVEL
335-345: SAND-GRAVEL
345-350: Clean coarse SAND
350-360: Fine clean SAND
360-365: SAND
365-369: SAND-small GRAVEL
369-375: SAND-hardpacked
375-380: SAND-softer, very fine
380-390: SAND-SILT, very fine
390-395: SAND-GRAVEL
395-400: SAND
400-413: Fine SAND and SILT (caving)

REMEDIATIONS:
Jun 64, Crowe
Installed plastic piezometer tubes
Jul75, M. Bultena, cleaned well
Jul77, Bigham. set cement plug



- Elevation of reference point: (top of casing) [710.67-ft]
- Height of reference point above ground surface [ND]
- Depth of surface seal [ND]
- Type of surface seal: None documented
- I.D. of surface casing (If present) [ND]
- DRILLER'S NOTE: Casing may be parted at joint 50 ft from top
- I.D. of riser pipe: [8-in]
  Type of riser pipe: Carbon steel
- Diameter of borehole: [9-in nom]
- Type of filler: Not documented
- Elevation/depth top of seal
  Type of seal: Not documented
- Depth top of perforations: [255-ft]
  255-320-ft, 3 cuts/ft
  320-380-ft, 2 cuts/2 ft
- Cement plug, " 300-310-ft
- Depth bottom of perforations: [380-ft]
- Depth bottom of casing: [388-ft]
- Depth bottom of borehole: [413-ft]

Drawing By: RKL/6N38W70.ASB Date: 29Jun92

Reference: HANFORD WELLS

WELL NAME	699-37-82A	COMPLETION DATE	10/10/60
CASING ELEV.	636.75 Feet	INITIAL	
WELL DEPTH	175.00 Feet	DEPTH TO WATER	163.0 ft
DRILL DEPTH	440.00 Feet		
COORDINATES N-S	37018 P		
E-W	-81988 P	PAGE	1 of 1